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AUTHOR	Tait, Jack
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ABSTRACT

Basic information about the quality of our nation's drinking water is contained in this brochure. Written for the general public to familiarize them with the situation, it will also help them evaluate the state of the nation's drinking water as well as that of their own communities. The need to assure reliable sources of healthful drinking water for present needs and future growth is discussed together with a few of the standards already established, areas where improvement is needed, water treatment processes presently in use, and the topics and directions of the Environmental Protection Agency's water hygiene research. It concludes that while efforts at all levels of government are needed, the ultimate success of these efforts will be determined by the degree of concern and vigilance of hometown Americans across the country. Ideas for becoming informed and involved citizens are included. (BL)

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a drop to drink

. . . a report on the quality of our drinking water

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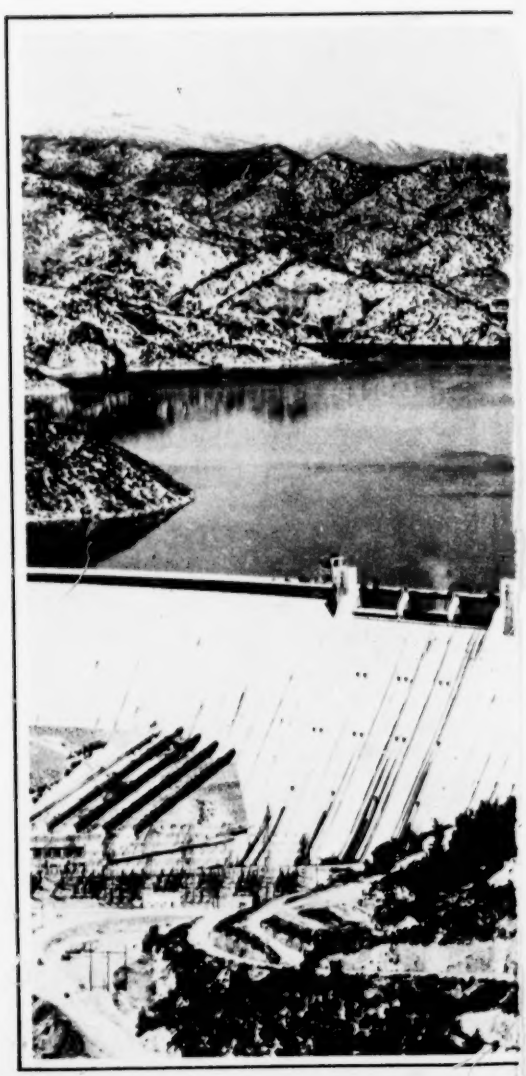
A DROP TO DRINK

. . . a report on the quality of our drinking water

The modern American in his own community is challenged by the need to assure reliable sources of healthful drinking water for present needs and future growth. While efforts at all levels of government are basic to fulfilling this need, the ultimate success of these efforts will be determined by the degree of concern and vigilance of hometown Americans across this land.

William D. Ruckelshaus
Administrator



U.S. ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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SHASTA RESERVOIR, CALIFORNIA

introduction

An adult American drinks from one and a half to five or more quarts of water a day depending on climate, workload, body size, and many other factors.

Most of us assume that the water we drink is safe. It usually is, but some of us are using improperly treated drinking water contaminated by bacteria, toxic chemicals, metals, and a possible wide range of other pollutants.

A minimum of 4,000 cases of waterborne illnesses occur each year in this country; the actual total may be 10 times greater. Further, medical science has not yet determined the effects on man of long-term, low-level exposure to contaminated drinking water.

Impure drinking water could become a major problem in this decade as the pressures of expanding population, economic growth, and new industrial processes make us turn to new sources of polluted raw water and accelerate water re-use.

It is our responsibility as citizens to insist upon safe drinking water. This booklet is designed to help evaluate the state of the Nation's drinking water, and, more importantly, that of our own communities.

is your drinking water safe?

An extrapolation of the 1969–1970 Community Water Supply Study, a field inspection and evaluation of 969 community water supply systems conducted by the Department of Health, Education, and Welfare, indicated that

about 5.4 percent of all Americans, or 8 million people, are served impure drinking water from an estimated 5,000 of the Nation's community water systems. The majority of these deficient systems serve smaller communities. In addition, some 20 million people today are without running water and are hauling and consuming water from suspect sources.

Also, another 30 million Americans obtain water from individual sources such as wells and springs, many of which are unprotected against dangerous impurities.

In the decade 1961-1970, there were 130 known or reported outbreaks of disease or poisoning caused by contaminated drinking water. Twenty persons died and an estimated 46,000 became ill, many seriously. Some EPA water supply experts believe perhaps 10 times as many such outbreaks occur, but go unreported for a variety of reasons and that countless individual sufferers—and their doctors—fail to associate ailments with contaminated water.

Illnesses known to be caused by germ-laden drinking water include infectious hepatitis, salmonellosis, and gastroenteritis.

EPA water supply investigators are concerned about viruses in drinking water because of deficiencies in operation, treatment facilities and distribution of many of our water systems.

New families of pollutants are degrading drinking water. The use of chemical compounds for agricultural, industrial, institutional and domestic purposes has increased sharply in the last several decades. There are thousands of toxic chemical compounds in industrial use today. Many new chemicals are developed each year and many of these enter and contaminate both surface and ground waters.

Some of the chemicals found in drinking water are known to cause cancer, genetic mutations, or birth deformities, but this does not necessarily mean that scientists have attributed such pathologies to the ingestion of drinking water.

Chemical contaminants such as phosphorous (from fertilizers), nitrates, pesticides, detergents, trace amounts of metals, acid from mine drainage, cyanide, phenols and radioactive substances, solvents and halogenated hydrocarbons are relatively new threats to our water sources.

Most conventional treatment processes, originally designed to produce water from less-polluted sources, are not as effective in the removal of increasing amounts and varieties of chemical contaminants, trace metals and radioactive materials.

a general review of the situation

There are between 30,000 and 40,000 municipal water supply systems in this country, large and small. Many were not designed to cope with present-day raw water quality. These systems were designed, primarily, to remove coliform bacteria from the relatively clean water of earlier days. The principal concerns at that time were typhoid, cholera and dysentery. The first two of these diseases now have been routed in the U.S. for the most part.

Today, new threats to public health are appearing in drinking water while much of the apparatus to meet these threats remains tuned to contamination problems of an earlier era.

Our national water resources are finite but our demand for water continues to rise steadily. This fact, plus the increasing volume, variety, and complexity of pollutants that enter surface and ground water, pose problems.

Federal standards for potable water were first issued in 1914 in response to legislation designed to prevent the interstate spread of communicable diseases. The standards were modified and expanded a number of times. Those in use in recent years are the 1962 U.S. Public Health Service Drinking Water Standards. When the Environmental Protection Agency (EPA) was established in December, 1970, it took responsibility for the Federal standard-setting authority, and is revising the 1962 drinking-water standards. A proposed set of new standards is under review by EPA's Advisory Committee on the Revision and Application of Drinking Water Standards.

For chemical and biological constituents affecting water quality, the standards set **mandatory** limits for health-related constituents and **recommended** limits for certain characteristics affecting appearance, taste and odor. Although application of the standards is limited to water supply systems serving interstate carriers, most

large cities and the States use the standards as guidelines to regulate their drinking-water quality. Nevertheless, as was noted earlier, results of the Community Water Supply Study completed in 1970 show by extrapolation that some 8 million persons are served potentially dangerous water from an estimated 5,000 community water supply systems.

Principal findings of the study, which evaluated 969 community water supply systems, were:

—36 percent of 2,600 individual tap-water samples contained one or more bacteriological or chemical constituents that exceeded the limits of the 1962 Federal Drinking Water Standards;

—56 percent of the systems showed facility deficiencies relating to equipment design, construction, or condition of the basic plant;

—77 percent of the plant operators were inadequately trained in water microbiology, and 46 percent were deficient in chemistry related to their assignment;

—79 percent of the systems had not been inspected by State or county authorities in the calendar year preceding the study.

Overall, smaller systems were found to have more deficiencies than larger ones.

Application of the Federal Drinking Water Standards is limited to implementing the Federal responsibility for preventing the spread of communicable diseases in interstate commerce. EPA enforces regulations that preclude interstate carriers from utilizing water from sources that do not comply with the Federal standards. These standards apply to only the 700 or so of the 30,000 to 40,000 public water supply systems.

room for improvement

There is room for a good deal of improvement in our national drinking-water supply program. Three major deficiencies are noted.

- The application of Federally enforceable standards is not broad enough to cover all community water supply systems.
- Some community water supply systems suffer structural or operational defects and lack sufficient numbers of trained personnel and thus limit their capability to deliver drinking water of acceptable quality on a continuing, reliable basis.
- Many State and local control programs are not providing adequate regulation of local water supply systems because they do not have enough regulatory personnel to do the work.

Primary responsibility for assuring safe drinking water generally rests with State and local governments. If this responsibility is to be met, water suppliers must be held strictly accountable for the quality of their product.

There are legislative proposals to authorize the EPA Administrator to establish National Drinking Water Standards to protect the public health. These standards would specify not only mandatory, maximum levels of contaminants, but would include criteria and procedures for the operation and maintenance of water supply systems.

Other primary elements of proposed Federal legislation are:

—Development and publication by the EPA Administrator of recommended limits for constituents and characteristics that affect, for example, the taste, odor, and color of drinking water. These recommended (not mandatory) limits would be helpful as guidelines for States and communities, even though a health risk is not involved.

—Provision for primary enforcement responsibility for drinking-water standards to lie with States and local governments, with Federal authority to be used only in case States and local governments fail to act.

—Provision for citizen suits against suppliers.

—A mechanism whereby EPA and the States could regularly obtain information on the quality of water delivered by each system to the user.

—Authorization for EPA to continue to conduct and promote research into all aspects of water hygiene.

research

Water hygiene research is essential to provide the scientific data and methodology that will enable all levels of government to work for and assure a safe and aesthetically acceptable drinking-water supply for public consumption.

EPA research, for example, is developing techniques to enable monitoring of viruses in drinking water. The association of viruses with hepatitis and other diseases is well known but viruses have been difficult to locate.

EPA is investigating the degree to which minimum chlorination and other types of disinfection of drinking water eliminate viruses along with bacteria. Viruses will not be removed from water supplies unless modern treatment systems are operating properly. Much more research is needed on this potentially critical problem. Work also is required to develop effective methods to protect our water supplies from new exotic toxic chemicals and from radioactive wastes.

EPA's water hygiene research is primarily directed to:

—Epidemiological investigations of water-borne diseases and toxicities to show the relationship between water quality and disease.

—Development and application of sensitive methods for isolating and identifying disease-producing orga-

treatment

nisms present in drinking water at the faucet. The results of this research will contribute to the improvement of water supply treatment methods, to the formulation of bacterial criteria for drinking water, and to the determination of the quality of water reaching the public.

—Development and application of procedures for recovery and identification of potentially harmful organisms in drinking water.

—Development and evaluation of improved water treatment processes. Conventional water treatment procedures do not remove some chemicals that may be found in drinking water sources.

—Determination of the acute and long-range chronic effects on man of organic and inorganic chemicals that may be found in drinking water. Many of the thousands of different toxic chemicals in industrial use today find their way into water supplies and these studies seek to determine safe tolerance limits of these chemicals in drinking water.

—Development of simple, rapid methods for detection and measurement of bacteria, chemicals and toxic agents in water to permit rapid routine monitoring of drinking water supplies.

The quality of source waters, generally, will determine the treatment processes required to produce safe, acceptable drinking water.

All **surface waters** are subject to temporary deterioration in quality through increased levels of turbidity, algae growths, and miscellaneous contaminants. To be on the safe side all surface waters should receive a degree of treatment more extensive than disinfection. This treatment could include flocculation, sedimentation, or filtration, or some combination of these procedures.

If waters are too contaminated for treatment by intermediate processes, they will require conventional treatment, including pre-disinfection, coagulation, sedimentation, granular filtration, and post-disinfection. Even though conventional treatment is provided, great care should be taken to prevent and control contamination of the raw-water source.

Disinfection should be the minimum recommended treatment for **ground water** used in public water supply systems. Over the years, drinking water from protected wells has been served to customers without any treatment. However, contamination of distribution systems together with related outbreaks of disease have demonstrated the need for maintaining residual levels of a disinfectant throughout public systems.

Ground water exists in a saturated zone of the earth's crust. Individual homes use ground supplies from springs and wells; these serve some 30 million Americans. In addition, about 80 million people are served by community systems that draw upon ground water. Water from deep wells is usually of acceptable bacteriological quality but variations due to ecology make generalizations unreliable. It has been reported that infectious hepatitis and typhoid fever are problems arising from contaminated shallow wells in some areas. Such pollution may be caused by seepage of contaminated **surface** waters.

Samples of water for farmstead use should be taken periodically during the year and analyzed for bacteriological, physical, and chemical characteristics.

Many species of bacteria are capable of establishing cultures in unclean or corroded pipes. Samples of water for analysis should be taken at the customer's faucet as well as at the source to determine the presence of any microbial buildup in piping systems.

what about the future?

The Federal Water Pollution Control Act of 1972 proclaims two general goals for the United States:

—wherever possible by July 1, 1983, water that is clean enough for swimming and other recreational use and clean enough for the protection and propagation of fish, shellfish, and wildlife.

—and then by 1985, no more discharges whatsoever of pollutants into the Nation's waters.

This is a strong commitment to end water pollution to the greatest degree possible, and the Act itself establishes the machinery and financial support required to accomplish this end.

Obviously, improvement of raw-water sources would mean better drinking water. Such improvement would reduce the risk to public health. However, surface water will still require treatment before it is introduced to water supply systems. It still will have to go through coagulation, sedimentation, filtration, taste and odor control, and disinfection because of the possibility of human error and the introduction of contaminants. The water supply treatment plant is the last barrier between the consumer and impure water.

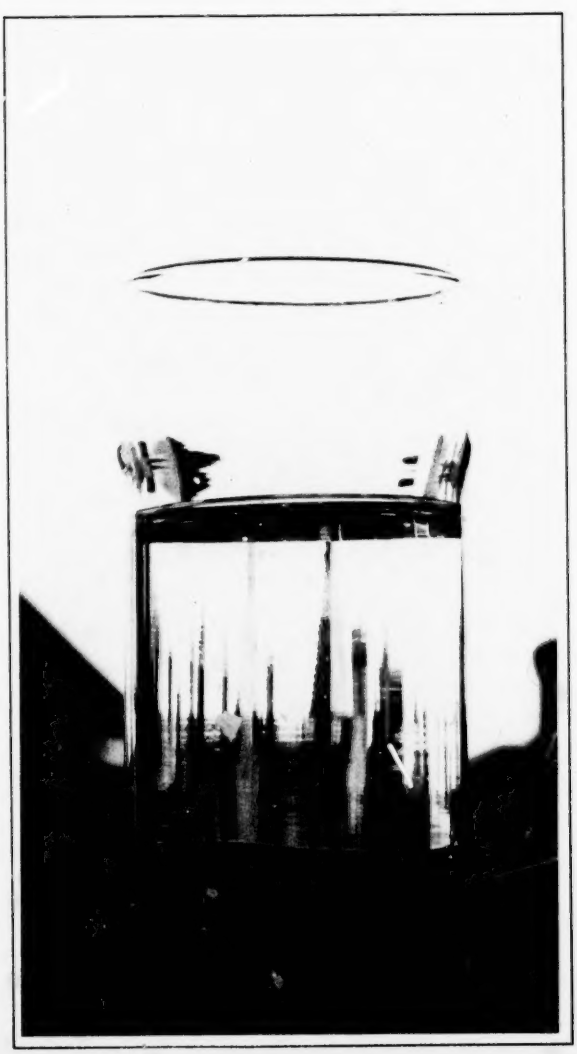
It is essential that we broaden the development of waste water reclamation, reuse, recycling, and recharging as a major element in water resource management. However, reclamation systems must be designed and operated to avoid health hazards and damage to the environment.

An estimated 50 percent of the Nation is served by drinking water from surface sources that receive industrial waste, untreated sewage, urban runoff, and effluent from sewage treatment plants. Health officials have relied on storage and treatment of the waste water to protect the public against infectious diseases and toxic substances.

Direct reuse—waste water to treatment plant to kitchen tap—requires careful research and investigation. A direct interconnection could present health problems caused by viruses or bacterial or chemical buildup. The direct introduction of chemicals from a waste stream and their buildup through a recycling system could present increased long-term health hazards. Accidental spills or sabotage could present an acute threat in a closed system, and the questionable record of reliability of waste water treatment plant operation is also a threat to water purity in a closed system. Safeguards must be provided to prevent the introduction of untreated or inadequately treated wastes into drinking-water supplies.

Some system of stream storage, or holding and dilution reservoirs, may be required between the reclamation plant and the potable water intake. Biological and chemical monitoring of storage waters would be essential.

Desalination of waters could supply many areas of the country with new drinking water sources. Although desalination is now used in many parts of the world, it is relatively expensive and considered by many to be uneconomic, however, research continues to bring the costs down.



an informed citizenry

Citizen action could assure safe drinking water and avert a possible national health crisis in the future. But first, people must stop taking the purity of their own drinking water for granted.

As a citizen, you should express to local, State and Federal officials your feeling of concern about having drinking water that is safe and palatable.

You should familiarize yourself with your local drinking-water problems—the adequacy of future supplies, treatment and testing processes, standards of purity, and directions of current research.

You should come to recognize that the protection and safety of a public water supply system depend upon the sanitary environment, quality, and quantity of source waters, the effectiveness and reliability of treatment processes, the integrity and capacity of storage and distribution systems, the quality-control surveillance, and the qualifications and effectiveness of the operating personnel.

An informed citizenry, willing to exert a full measure of power, can demand and get safe water supply systems.

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Written by Jack Tait

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can you be active?

Find out what constitutes good treatment of drinking water. Then find out how your water is treated. Are steps taken to kill bacteria, to destroy bad tastes or odors, to settle out chemically treated impurities, to filter out remaining impurities? Check the procedures used by your water supplier.

Examine testing records. How frequently does your supplier test? Is the water tested for nitrate levels, for mercury and other metals as well as for the more common contaminants?

Insist that pipes that bring the water to the tap be examined for possible contamination.

If you are dependent upon well or spring water, check if samples from these sources are routinely tested by your [illegible] county health departments.

Familiarize yourself with local and State laws governing drinking water and with applicable drinking-water standards.

Finally, make your concern about having drinking water that is chemically and biologically safe and palatable a matter of record with appropriate local, State, and Federal officials.

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